Harmony Evolution Options
For Process Industries Users
Introduction
Presenter – Kent Morrisey

- ABB Business Development Manager – DCS Evolution
- Atlanta, GA Area
- 25 Years with ABB in Engineering, Service, and Sales
  - Worked with OIU’s and COM Modules
  - Acquired by ABB twice!
- Lived in Albany, NY
“We’re going to reinvigorate the Elsag Bailey Product Line”

Joe Hogan, ABB CEO

Keynote Address, Automation & Power World, Orlando, FL April 2011
System Update

Agenda

- Lifecycle Update
- Evolution Path
  - I/O
  - Controller, Communications, and Engineering Tools
  - Operator Stations
- Summary
How to Maintain an aging automation system.....

Objectives

- Improve Benefit
- Lower Costs
- Extend Life
- TCO

Yr1 Yr2 Yr3 Yr4 Yr n

$
Strategy Remains the Same Evolution Without Obsolescence

- No product will be removed from active sale until a compatible, equivalent or superior product is made available
- Investment Protection
  - Intellectual Property
  - Capital Equipment
- Incremental, stepwise execution
What has Changed?
Life Cycle Commitment

- Previous Support commitment increased from 2025 to *indefinitely*
- Active investment
- New features and functions at all levels of the system
- Introduction of *Symphony Plus*
  Product Name
Evolution Planning
On-going collaborative process

- Identifies business needs, goals, and priorities
- Insight into process/system risk areas
- Results in short and long term roadmap
- Continuous re-evaluation: business needs and solutions
- Recognition of new system functionality and solutions that add value
- Known timing for evolution action (2-5 years); assist budgeting process

<table>
<thead>
<tr>
<th>ABC, Inc. Harmony System Overview</th>
<th>Lifecycle Status</th>
<th>Support Status</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Controller type:</strong> INFI 90 Controllers (MFP)</td>
<td>Limited</td>
<td>OK</td>
<td>Most MPS I components are no longer manufactured. Upgrades to MPSIII are strongly recommended.</td>
</tr>
<tr>
<td><strong>I/O type:</strong> Rack I/O</td>
<td>Active</td>
<td>OK</td>
<td>While some installed INFI90 Rack I/O modules are in Limited phase, Active-phase direct-replacement modules are available.</td>
</tr>
<tr>
<td>Network 90 I/O</td>
<td>Limited</td>
<td>OK</td>
<td>Active-phase direct-replacement modules are available.</td>
</tr>
<tr>
<td><strong>System Communications:</strong> INFINET</td>
<td>Active</td>
<td>OK</td>
<td>Active-phase replacements are available for all installed comm. equipment – slight difference in architecture (i.e.: MPI no longer required.).</td>
</tr>
<tr>
<td><strong>Cabinet Power Supplies:</strong> INFI 90 Power System (MPSI)</td>
<td>Limited</td>
<td>Evolution Recommended</td>
<td>Most MPS I components are no longer manufactured. Upgrades to MPSIII are strongly recommended.</td>
</tr>
<tr>
<td><strong>Engineering Tools:</strong> WinTools</td>
<td>Limited</td>
<td>Evolution Recommended</td>
<td>Support for WinTools software effectively ended in 2006. Users are strongly encouraged to move all WinTools-based configurations to Composer.</td>
</tr>
<tr>
<td><strong>Operator Workstations:</strong> OS 20 Series</td>
<td>Limited</td>
<td>Evolution Recommended</td>
<td>OS 20 was removed from sale in 1999. Recommend evolution to 800xA Process Portal.</td>
</tr>
<tr>
<td><strong>LAN 90 PCView</strong></td>
<td>Classic</td>
<td>Evolution Recommended</td>
<td>Software will be in classic phase through 2010. Recommend maintaining software at latest revision, stocking sufficient hardware spares and planning for evolution to 800xA Process Portal.</td>
</tr>
</tbody>
</table>
System Update

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  - I/O
    - Controller, Communications, and Engineering Tools
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Basic Overview of Bailey DCS

PCU: Process Control Unit

Each PCU has a redundant pair of communication modules

Redundant Process Control Network
• INFI-Net, Super Loop, Plant Loop

Computer Interface Units
• Serial, SCSI links to Computers

Connectivity Servers
Gathers data for operator consoles

Operator Consoles
Basic Overview of Bailey DCS

PCU: Process Control Unit

Module Mounting Units
Called “card cages” or racks
Houses all DCS Modules
- Controllers
- Communications
- I/O
Max 8 per PCU

Cabinet Power Supply

Controllers
Execute control logic

Communication Modules
Pass information between devices i.e. PCUs, engineering tools, PI, etc

I/O
Interact with real world devices
## Product Lifecycle Status
### Power Supplies

<table>
<thead>
<tr>
<th>Class: Power</th>
<th>Product Family</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>MPS III</td>
<td>MPSIII is in the “active” phase of its product lifecycle.</td>
</tr>
<tr>
<td>Limited</td>
<td>MPS II</td>
<td>Transitioned to “limited” in January 2007. Recommend evolution to MPSIII.</td>
</tr>
<tr>
<td>Obsolete</td>
<td>MPS I</td>
<td>Recommend evolution to MPSIII.</td>
</tr>
<tr>
<td></td>
<td>Network 90 Power System</td>
<td>Based on vendor component availability, some Network 90 power components are obsolete. Recommend evolution to MPSIII.</td>
</tr>
</tbody>
</table>
Power Supplies
Harmony Power Supply - MPSIII

- Multi-Voltage DC Power System
  - System and Field Power
- 2N and N+1 Configuration
- System Monitoring
- “Slide-in” Design
- Evolution for Network 90, MPS I (PMU), and MPS II Supplies
## Product Lifecycle Status
### I/O Subsystem

<table>
<thead>
<tr>
<th>Class: I/O</th>
<th>Product Family</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>S800</td>
<td>S800 I/O is configured using Composer and standard function blockware.</td>
<td></td>
</tr>
<tr>
<td>Harmony Rack (IMxxxxx)</td>
<td>Represents the latest version of Harmony Rack I/O and includes: IMASI23, IMASO11, IMCIS22, IMDSI13, IMDSI14, IMDSI22, IMDSM04, IMDSO14, IMDSO15, IMFEC12, IMHSS03, IMQRS22, IMSED01, &amp; IMSET01.</td>
<td></td>
</tr>
<tr>
<td>Harmony Block</td>
<td>Transitioned to Limited in January 2011. Recommend evolution to S800 I/O.</td>
<td></td>
</tr>
<tr>
<td>Network 90 I/O (Nxxxxx)</td>
<td>Recommend evolution to the latest members of the Harmony Rack I/O family (IMxxxxx).</td>
<td></td>
</tr>
</tbody>
</table>

*Exception: P-HB-IOR & P-HB-RMU, & P-HA-REP-RFO are “active.”*
Symphony Harmony
Comprehensive I/O system

- Modular to meet varying I/O requirements
  - Local and remote I/O options
  - Rack and DIN I/O options

- I/O Types
  - Analog Input
  - Analog Output
  - Pulse Input
  - Digital Input
  - Digital Output
  - Turbine Control

- SOE timestamp resolution of +/- 1 msec across the entire Harmony system
Rack I/O & S800 I/O

- Rack Form Factor
  - Supports most existing Net 90 and INFI 90 Modules
  - Designed for centrally located I/O
  - Current version available for most I/O types
  - Non Redundant
  - Cabinet Power system required
  - Flexible terminations
- DIN Rail Form Factor
  - Functions with BRC controllers and IOR Gateway
  - Ideal for Remote I/O Applications
  - Flexibility to Expand I/O Capacity
  - Redundant I/O Capability
  - 24VDC Power
  - Intrinsic safety applications
  - Smaller footprint
  - Flexible mounting and terminations
  - Improved Ability to “Force” I/O
System Update

Agenda

- Lifecycle Update
- Evolution Path
  - I/O
    - Controller, Communications, and Engineering Tools
  - Operator Stations
- Summary
### Product Lifecycle Status

**Controllers**

<table>
<thead>
<tr>
<th>Class: Controller</th>
<th>Product Family</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active</strong></td>
<td>BRC</td>
<td>Current active family components include BRC300 &amp; BRC400/410.</td>
</tr>
<tr>
<td><strong>Classic</strong></td>
<td>HAC</td>
<td>Transitioned to “Limited” in January 2005. Recommend evolution to BRC 400</td>
</tr>
<tr>
<td><strong>Limited</strong></td>
<td>MFP</td>
<td>Recommend evolution to BRC300 or BRC400.</td>
</tr>
<tr>
<td><strong>Obsolete</strong></td>
<td>MFC, AMM, LMM, COM</td>
<td>Recommend evolution to BRC300 or BRC400.</td>
</tr>
</tbody>
</table>
Harmony Bridge Controllers
BRC-300, BRC-400 & HPG-800/BRC-410

- Rack Form Factor
- Motorola 32-bit Coldfire microprocessor technology
- Forward Compatibility – BRC’s retain controller (MFC, MFP, etc) hardware and software architecture
- Support for all Harmony I/O sub-systems
- Downloadable Firmware
- More than 10x more powerful than MFP’s
- Modulebus Support
- BRC 400/410 specific enhancements:
  - Additional Memory (2MB NVRAM)
  - Support for 30,000 function blocks
  - Flexible on-line configuration capability
  - MODBUS TCP Ethernet Communication (BRC410 Only)
Function Block Configuration
- FB’ associated with ModBus TCP Interface

- Configured like any BRC300 or BRC400
- Supports On-Line Configuration!
- ModBus Interface can:
  - Read any INFI 90 Function Block
  - Write to any of the following:
    - AOL – FC 30
    - DOL – FC 45
    - BASROQ – FC 137
    - BASBOQ – FC 138
- INFI 90 Function Block to ModBus point mapping configured using Harmony Gateway Software (HGS)
Symphony Plus Controllers
Use Case: Merge multiple Modbus RTU Interfaces

**Modbus RTU interfaces**

- **PCU XX**
  - Modbus Points: 200 Real + 300 Boolean = 500 Total

- **PCU YY**
  - Modbus Points: 450 Real + 450 Boolean = 900 Total

- **PCU ZZ**
  - Modbus Points: 250 Real + 550 Boolean = 800 Total

**Modbus TCP interface**

- **PCU NN**
  - Modbus Points: 900 Real + 1300 Boolean = 2200 Total

**Switches**

- **Modbus TCP to RTU Converters**
  - RS232

- **RS485**
### Product Lifecycle Status

**Communications**

<table>
<thead>
<tr>
<th>Class: Communications</th>
<th>Product Family</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INFINET (INxxxxx)</strong></td>
<td>Current active family components include: INNPM22, INNIS21, INICI03-SCIL, INICT13A, INIIL02-L, INIIR01-232L, INIIT13, INIIT12, INSEM11, INSOE01, &amp; INTKM01.</td>
<td></td>
</tr>
<tr>
<td><strong>Plant Loop (Nxxxxx)</strong></td>
<td>Recommend evolution of system network to INFINET communications.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If Plant Loop / Super Loop installed, PCU communications (controller to controller communications) should be inspected as well. Where Module Bus is used, Controlway communication evolution is recommended.</td>
<td></td>
</tr>
</tbody>
</table>
Symphony Plus Communications

- Ethernet interface to INFI-Net used by:
  - Composer 5.1
  - Harmony OPC
  - Harmony Connect (800xA Process Portal v. 5.1A)
  - S+ Operations

- Security Modes
  - **Basic** (Twofish) [Default]
    - 128-bit block cipher
  - **Advanced** (TLS1/SSL3)
    - 256-bit encryption

- Supports up to 30,000 tags (Ethernet)

IET800: INFI-Net to Ethernet Transfer
Symphony Plus – Control and I/O
S+ Harmony Communications: ICI800 / IET800

Composer Client/Server Workstation  S+ Operator Workstations  S+ Operations Servers

100 MB Ethernet TCP/IP

INIC800 (Ethernet CiU) can be used for:

- Up to 10 Composer Client Connections
- Dedicated Connection to HMI Server

INIFI 90, Harmony or Symphony Plus Process Control Units (PCU’s)
Symphony Plus – Control and I/O
Upgrading Serial or SCSI CIUs to Ethernet
# Product Lifecycle Status
## Engineering Tools

<table>
<thead>
<tr>
<th>Class: Tools</th>
<th>Product Family</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Composer</td>
<td>The active software version is Composer Version 5.1</td>
</tr>
</tbody>
</table>
Composer Engineering Tools

Highlights

- “View and Monitor” mode
  - Browser based configuration viewing with live data
  - Available to Process Portal, CVMS clients, CNT or any network PC Browser

- Online Maintenance Tools
  - Provides users with the ability to troubleshoot, perform diagnostics, and maintain the operating Harmony system

- Stand-alone Configuration Viewer
  - Allows viewing and tuning of CFG files without requiring Composer software or projects

- Power Tools
  - Suite of applications that reduce engineering and configuration effort
    - Control Logic Editor
    - Revision Manager
    - Automatic Drawing Generator
    - Advanced Trend (runtime monitoring and tuning)

- Batch Data Manager
  - Family of engineering tools used to create, edit, manage, download, and debug batch, sequential, and user defined function code configurations
Harmony System Update
Composer Engineering Tools Software Version 5.1

- New Microsoft Operating Systems
  - Windows 7
  - 2008 Server (R1)
- **IET-800 Ethernet CIU Support**
  - 10 Composer Clients
- Support for new FC’s AOLDB & DOLDB
- Support for Symphony Plus
System Update

Agenda

- Lifecycle Update
- Evolution Path
  - I/O
    - Controller, Communications, and Engineering Tools
      - Future Plans
  - Operator Stations
- Summary
Symphony Plus Future Planned Release
Harmony Control & Communications on a DIN-Rail

- **S+NET**: Control Network
  - Protocol = “INFI-NET over Ethernet”
  - Connects consoles (S+ Operations) and tools (S+ Engineering) to HC800/CP800 Controllers

- **HC800**: Harmony Control Processor
  - Executes INFI 90 Function Codes
  - BRC / HPG Functionality

- **CP800**: Communications Processor
  - Combination of NIS / NPM modules
  - Control Network Interface

- **CTB810/811**: Comm. Term. Board
  - HN800 I/O interface for Rack I/O (via RIO22), S800 and new I/O
  - CW800 provides PTP communications between controllers
Symphony Plus Future Planned Release

PDP800: Profibus DP Master for Harmony

- Profibus DP V2
- SOE Time-Stamping
- Master & Line Redundancy
- Up to 120 Profibus Slaves per PDP800
- Communicates to Controller via [Redundant] HN800
Symphony Plus Future Planned Release
HAI805 & HAO805: HART AI & AO Modules

- Hart AI Modules
  - Initially with HC800
  - Eventually with BRC controllers
  - Secondary and Tertiary Values
Symphony Plus Future Planned Release
S+ Engineering: Tools integration with Composer

COMPOSER

FIELDBUS TOOL

CLT’s

Object Exchange

Data Model Exchange

DTM’s & GSD’s

Library Structure

Navigation
Symphony Plus Future Planned Release
IEB800: INFI-Net to Ethernet Bridge

Composer Engineering Tools Workstation

S+ Operation Servers

S+ Operator Workstations

Control Network
100MB Ethernet TCP/IP

INFI-Net Ethernet Bridge

INFI-90, Symphony or Symphony Plus Process Control Units (PCU's)

INFI-Net

INFI-Net

S800 I/O Modules
System Update

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# Product Lifecycle Status
## Operator Consoles

<table>
<thead>
<tr>
<th>Class: Consoles</th>
<th>Product Family</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active</strong></td>
<td>800xA Process Portal</td>
<td>800xA Process Portal is in the “active” phase of its product lifecycle.</td>
</tr>
<tr>
<td><strong>Obsolete</strong></td>
<td>S+ Operations</td>
<td>Symphony Plus Operations is in the “active” phase of its product lifecycle. Power and Water Industry focused.</td>
</tr>
<tr>
<td><strong>Limited</strong></td>
<td>Conductor NT</td>
<td>Conductor NT entered the “classic” phase of its product lifecycle on April 1, 2010. Recommend evolution.</td>
</tr>
<tr>
<td><strong>Obsolete</strong></td>
<td>LAN 90 PCView</td>
<td>Recommend evolution.</td>
</tr>
<tr>
<td><strong>Obsolete</strong></td>
<td>OIS 40 Series (includes CVMS software)</td>
<td>Hardware (limited) and Software (classic). Recommend evolution.</td>
</tr>
<tr>
<td><strong>Obsolete</strong></td>
<td>OIS 20 Series (includes OIS 20 &amp; OIS 25)</td>
<td>Recommend evolution.</td>
</tr>
<tr>
<td><strong>Obsolete</strong></td>
<td>OIU</td>
<td>Recommend evolution.</td>
</tr>
</tbody>
</table>
System 800xA Operations

- Integration Platform
  - Historical Data
  - Business Systems
  - 3rd Party Control Systems
  - Asset Optimization
  - Fieldbus Networks
- Personalized workplaces for focused information access
- Harmony diagnostic and management functions
System 800xA Extended Automation System
The Power of Integration

- One rich harmonized user interface including all control systems
- One integration point for all related applications
Improving Operator Effectiveness

Effective decision support environment

- Consolidated alarms & events
- Right click access to integrated information
- Personalized Workplace based on operations philosophy
- Filterable, separated asset alerts
- Seamless integration of data from multiple systems
- Configurable Application Bar
- Graphics based on MS WPF
System 800xA 5.1 Update
Improved Operator Effectiveness

- Point of Control
  - Better control of responsibility
  - Improves control room collaboration
- Alarm Management
  - Alarm Shelving and Alarm Analysis
- Snap-shot reporting
  - Improved visibility into plant status information
- Sequential Function Chart Viewer Improvements
System 800xA cpmPlus Smart Client
Integrating information for improved visibility

- Provides users with a browser based thin client for displaying information from System 800xA
  - Thin client based graphical displays
  - Trending and Statistical Process Control
  - Alarm and Event Reporting
  - Excel interface
  - PG2 Graphics in SV5.1A
System 800xA for Harmony
Process Portal: Integrated Diagnostic Information

Loop Topology Display:
- Enhancement from Table view
- Mimics feature from Conductor VMS
- Node details available by DBL-Click on node
- No engineering required
System Update

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- Summary
S+ Operations
Primary objectives for development

- Simple to use
- Scalable
- Secure
- Based on proven technology
  - S+ Ops is next revision to PGP
  - Power Generation Portal (PGP): +2300 systems worldwide
  - S+ Ops integrates Power Gen Information Manager (PGIM)
S+ Operations
Designed for high performance

- Flexibility & scalability – architecture requirements, systems small to large
- Reliability – unique fault tolerant architecture
- Security – support for NERC CIP compliance manager
- Integration – with all plant devices and systems
- Information management – advanced historian
- Operational efficiency – ergonomic operator workplace
- Alarm management tools - support for EEMUA 191
- Process optimization - Plant performance monitoring tools
- Migration – to evolve from earlier console platforms
S+ Operations
Scalable: serverless architecture

- Simple stand-alone node option
- ABB controllers connects
- 3rd party control & PLC connects
- Competitive for small systems
S+ Operations
Fault tolerant N+N server capability

- Supports multiple servers with parallel data streams
- Provides N+N server redundancy
- Clients can connect to any server
S+ Operations
Flexible architecture: server segregation per unit/area

- Independent servers for each plant area / unit
- Each server only acquires data from the related plant area
- Clients logically connected to a server set
- **Provision for client graphical pages to include tags from other servers**
S+ Operations
Flexible architecture: composite server all unit data in each server

- Servers maintain a complete plant database.
- Each server acquires data from the related plant area through connected controllers. Tags from other plant areas are acquired through the Server network.
- Clients are logically connected to one server, and from that server they can see tags for all plant areas.
S+ Operations
I/O scanners

- Plug-in drivers
  - Harmony/INFI (serial/SCSI/ethernet CIU)
  - Freelance 800F
  - 800xA AC800M
  - AC870P
  - Procontrol P13
  - OPC DA, AE, HDA
  - Modbus, Modbus TCP
  - IEC 870-5-101/103/104
  - DNP 3.0
  - Siemens Teleperm (XU)
  - General Electric GSM (Mark V/VI) (GE Standard Messages, GSM)
  - SPABUS
  - Text
S+ Operations
Tag database

- Supports large systems
  - Up to 512,000 tags per server
  - 256,000 boolean
  - 256,000 non-boolean
- Direct Harmony tag export Composer to S+ Operations
- Tag types include:
  - Native tags to Harmony
  - Analog
  - Digital
  - Calculated
  - Others
    - User configurable
    - Bit arrays
    - Text
    - LAB (manual entry)
S+ Operations
High performance operator workplace
S+ Operations
High performance graphic editor

- Build Hi-Performance HMI
- Grayscale Graphics
- State of the art display builder
  - Toolbars
  - Tag Browser
  - Templates
  - Symbol Libraries
  - ActiveX
  - Pictures (GIF and JPEG)
  - Drag and Drop support
  - Support link of object classes with instances
  - SODG Display Translator
S+ Operations
Basic control faceplates for Harmony

- Faceplates
  - DCS: Digital Control Stations
  - DD: Device Driver
  - MSDD: Multi-state Device Driver
  - PV: Analog Control Station
  - DI: Digital Input
  - RCM: Remote Control Memory
  - RMCB: Remote Motor Control Block
  - RMSC: Remote Manual Set Constant
  - TEXTSTR: Text Selector
  - DAANG: Data Acquisition - Analog
S+ Operations
Supports extended control faceplates
S+ Operations
Navigation to important information using aspect links

- Aspect Links (Right Click)
  - Tags link to other Applications
  - Links are customizable per tag
  - Link to documents or launch applications:
    - Alarm & Event
    - Instruction Manuals
    - Maintenance Packages
    - Standard Operating Procedures
    - Web pages
    - Plant P&ID’s
    - Operator Notes
S+ Operations

View control logic from graphic
S+ Operations
Faceplates from composer control logic
S+ Operations
Supports DBDOC call up hyperview
S+ Operations
Information Management: integrated historian

- Full featured historian integrated within S+ Operations
- Excel reporting and scheduled reports
- Calculation package / maintenance totalizers
- EEMUA 191 alarm management
- Process optimization platform used with OPTIMAX plant performance applications
- Supports thin client
S+ Operations
Integrated alarm analysis tools

Supports EEMUA 191 Standard

Report types
At the moment the following report types are available:

1) Alarm and/or Event frequency
2) Alarms and Events over time
3) Priority Distribution
4) Alarm Duration
5) Time to Acknowledge
6) Alarm performance levels
7) Control loops in hand mode
8) Operator actions
9) Intervals exceeding threshold
10) Distribution in plant areas
11) Standing alarms
12) CoOPccurences
13) Distribution
14) Detailed event sequence
S+ Operations
S+ ThinClient: available views

Intuitive navigation structure

Multi-line trend displays

View dynamic process graphics

Private user folders / signal explorer

User reports / scheduled reports

Filtered alarm and event List
System Update
Agenda

- Lifecycle Update
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Summary

- Lifecycle Extended Indefinitely
- New Developments at all levels of the Symphony system
- System 800xA continues as an evolution path for the Process Industry
- Symphony Plus Operations is now an available option
- Evolution Planning Services Available